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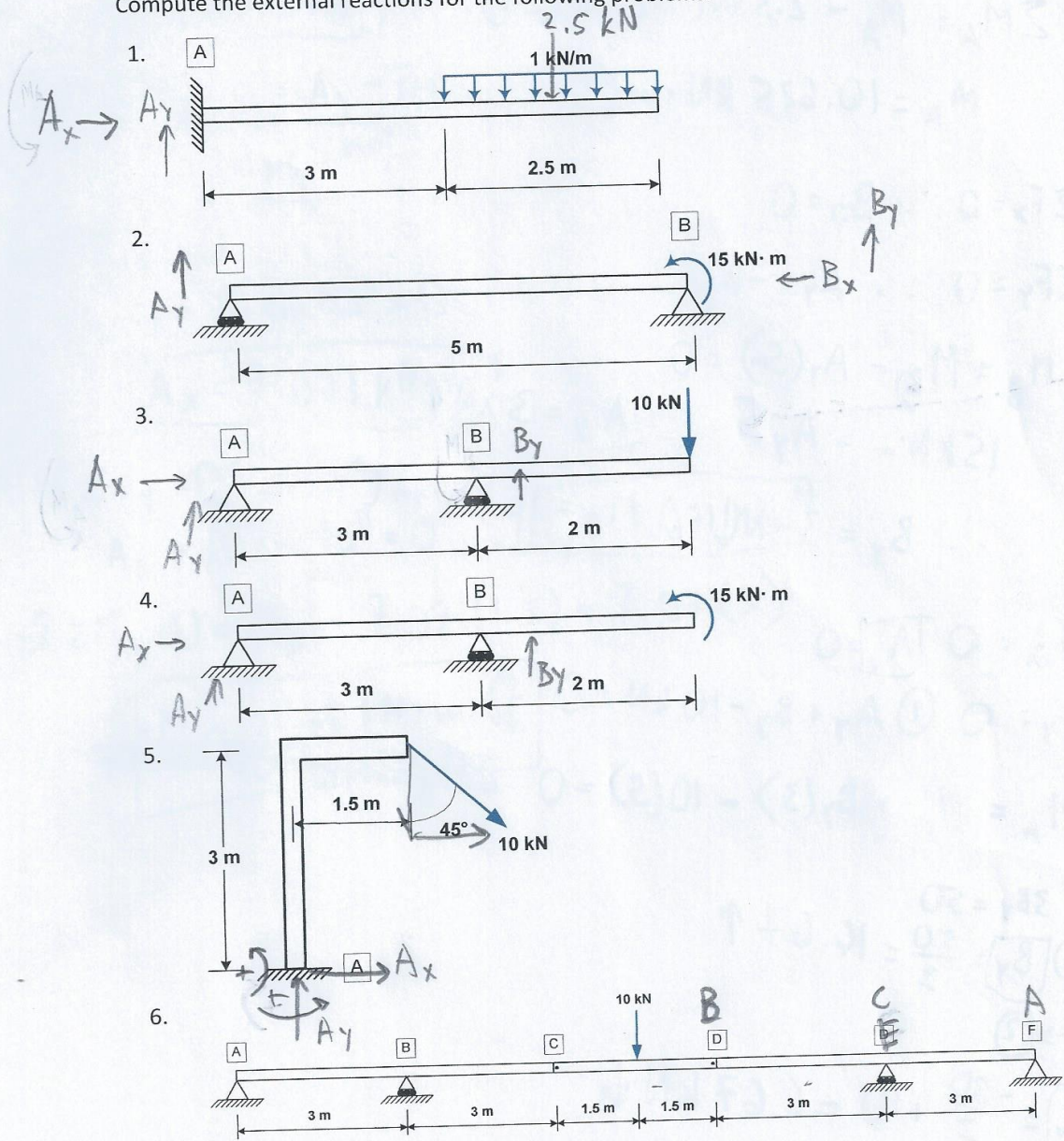
Jan. 19, 2015

CVG 2140 – Assignment No. 1 (External Reactions)

See Back for answers

(Due Date: Friday, January 23rd, 2015 by 5PM)

Compute the external reactions for the following problems:



Note: C and D are internal pins.

$$1. \rightarrow \Sigma F_x = 0 \therefore A_x = 0$$

$$\uparrow \Sigma F_y = 0$$

$$0 = A_y - 2.5 \text{ kN} \therefore A_y = 2.5 \text{ kN} \uparrow$$

$$\rightarrow \Sigma M_A = M_A - 2.5 \text{ kN}(4.25 \text{ m}) = 0$$

$$M_A = 10.625 \text{ kN} \cdot \text{m} \rightarrow$$

$$2. \rightarrow \Sigma F_x = 0 \therefore B_x = 0$$

$$\uparrow \Sigma F_y = 0 \therefore A_y = -B_y$$

$$\rightarrow \Sigma M_B = M_B - A_y(5 \text{ m}) = 0$$

$$15 \text{ kN} \cdot \text{m} = A_y 5 \therefore A_y = 3 \text{ kN} \uparrow$$

$$\therefore B_y = 3 \text{ kN} \downarrow \therefore M_A = 15 \text{ kN} \cdot \text{m} \rightarrow$$

$$3. \rightarrow \Sigma F_x = 0 \quad \boxed{A_x} = 0$$

$$\uparrow \Sigma F_y = 0 \quad \textcircled{2} \quad A_y + B_y - 10 \text{ kN} = 0$$

$$\rightarrow \Sigma M_A = M_A + B_y(3) - 10(5) = 0 \quad \cancel{\Sigma M_B} \quad \cancel{M_B} \quad \cancel{10(2)} \quad \cancel{A_y}$$

$$3B_y = 50$$
$$\textcircled{1} \quad \boxed{B_y} = \frac{50}{3} = 16.67 \uparrow$$

$$\textcircled{1} \rightarrow \textcircled{2}$$

$$\boxed{A_y} = \frac{-50}{3} + 10 = 6.67 \text{ kN} \downarrow$$

$$\Sigma M_B = 6.67(3) - 10(2)$$

$$\boxed{M_B} = 10.01 \text{ kN} \cdot \text{m} \rightarrow$$

$$\Rightarrow \sum F_x = 0 \quad \therefore A_x = 0$$

$$\curvearrowright \sum M_A = 0$$

$$0 = B_y(3) + 15 \text{ kN} \cdot \text{m}$$

$$\boxed{B_y = 5 \text{ kN} \downarrow}$$

$$+\uparrow \sum F_y = 0 = A_y - B_y =$$

$$\boxed{A_y = 5 \text{ kN} \uparrow}$$

$$S. \Rightarrow \sum F_x = 0$$

$$A_x + 10 \sin 45^\circ = 0$$

$$\boxed{A_x = 7.071 \text{ kN} \leftarrow}$$

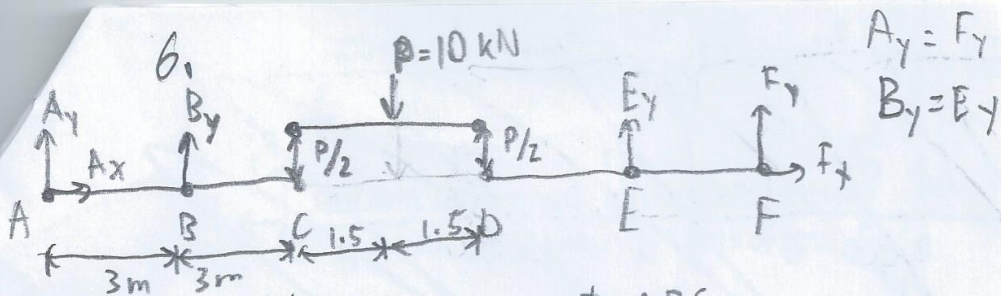
$$+\uparrow \sum F_y = 0 \quad A_y$$

$$A_y - 10 \sin 45^\circ = 0 \quad \therefore \boxed{A_y = 7.071 \text{ kN} \uparrow}$$

$$\curvearrowright \sum M_A = 0 = M_A - 7.071(1.5) - 7.071(3)$$

$$\curvearrowright \boxed{M_A = 31.82 \text{ kN} \cdot \text{m} \leftarrow}$$

6.



Establish Equilibrium on segment ABC

$$\rightarrow \sum F_x = 0: A_x = 0$$

$$\uparrow \sum F_y = A_y + B_y - 10/2 = 0: A_y = 5 - B_y$$

$$\curvearrowright \sum M_A = B_y(3) - \left(\frac{10}{2} \cdot 2(3)\right) = 0$$

$$B_y = 10 \text{ kN} \uparrow$$

$$\therefore A_y = -5 \text{ kN} = 5 \text{ kN} \downarrow$$

$$A_y = F_y$$

$$B_y = E_y$$